Fire Weather Operations Plan for Central Indiana

Introduction

The National Weather Service's Fire Weather Program is designed to provide forecasts, warnings, and consultation services for the prevention, suppression, and management of forest and rangeland fires and for a host of land management activities. These meteorological services are built to meet the weather requirements of federal and state wild land managers.

The program is customer-oriented and is not limited to just wild fire management, but also includes all forest and range management weather support (such as prescribed burns and spot forecasts). Weather support is available throughout the year and not just during the normal fire season.

This Operations Plan will cover services provide by the Indianapolis, IN Weather Forecast Office. The plan covers how weather services can be requested, how they will be provided, and how compensation will be rendered if need be.

This plan will be reviewed annually by all parties. Any intermediate changes or amendments will be coordinated with all parties involved before the changes are incorporated.

Fire Weather Organizational Directory

National Weather Service, Indianapolis
6900 W Hanna Ave
Indianapolis, IN 46241

Meteorologist in Charge:
Daniel McCarthy (Daniel.Mccarthy@noaa.gov)
Fire Weather Program Leader:
Sonia Mark Flechtner (sonia.mark.flechtner@noaa.gov)
Assistant:
Joe Skowronek (joe.skowronek@noaa.gov)

Internet Access

Main Fire Weather Page: http://www.crh.noaa.gov/ind/?n=fireweather

Prescribed Burn or Spot Forecast Request Page:

http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=ind

Nearby Offices' Internet Fire Weather Pages

WFO Northern Indiana

http://www.crh.noaa.gov/iwx/?n=fireweather

WFO Louisville, Kentucky

http://www.crh.noaa.gov/lmk/?n=fireweather

WFO Paducah, Kentucky

http://www.crh.noaa.gov/pah/forecast/firewx.php

WFO Wilmington, Ohio

http://www.erh.noaa.gov/iln/fireweather.htm

WFO Chicago, Illinois

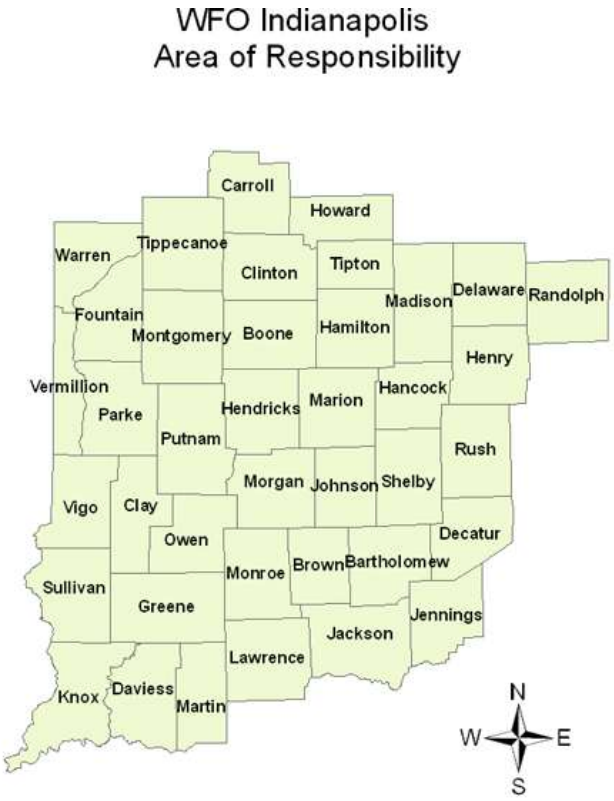
http://www.crh.noaa.gov/lot/?n=firewx

WFO Lincoln, Illinois

http://www.crh.noaa.gov/ilx/firewx.php

Forecast Area

The forecast area of responsibility for Indianapolis is shown below:



Fire Season

The normal fire season will be broken into two separate periods. The spring fire season will run from February 15 through April 30. The fall fire season will begin on October 1 and end December 15. These dates may be changed depending on the severity of the fire season.

Issuance Time of Routine Forecasts

During the fire season the narrative forecast will normally be issued around 4:00 AM and 4:00 PM Eastern Time, seven days a week. During the remainder of the year the narrative forecast will only be issued around 4:00 AM Eastern Time. The point forecast will be issued once per day around 4:00 PM Eastern Time during the fire weather season. Examples of narrative and point forecasts are included in the Attachments.

Content of Narrative Fire Weather Forecast

An example of the Fire Weather Planning Forecast is available in the Attachments.

A headline may be added to the top of the forecast, denoting significant weather, or for the issuance of a Red Flag Warning or Fire Weather Watch. The discussion will briefly cover locations of fronts and systems which produce the weather along with highlighting significant trends or changes that the forecaster anticipates. The first 36 or 48 hours of the forecast will cover specific weather elements mentioned below. The extended portion of the narrative forecast will pick up where the short term left off and continue out through day seven. The extended portion is a general forecast which mentions the possibility of precipitation, expected high and low temperatures for each day, and wind speeds and direction.

Elements of the narrative are described below:

1. Sky Cover:

A. Clear (or Sunny) – Less than 1/8th cloud cover.
B. Mostly Clear/Mostly Sunny -- 1/8th to 2/8ths of cloud cover.
C. Partly Cloudy/Partly Sunny -- 3/8ths to 5/8ths of cloud cover.
D. Mostly Cloudy -- 6/8ths to 7/8ths cloud cover.
E. Cloudy -- 8/8ths cloud cover.

2. Weather (Precipitation Type):

A. Rain--General, usually in a stable atmosphere.
B. Drizzle--General precipitation in a stable atmosphere.
C. Freezing Rain/Drizzle--Liquid precipitation that freezes upon impact with the ground or vegetation.
D. Sleet--Precipitation that falls in the form of frozen rain or partially frozen rain.
E. Snow--Frozen precipitation of relatively long duration, general or patchy, not showery.
F. Snow Flurries--Light snowfall of short duration with some clearing between occurrences.
G. Showers Rain/Snow--Of short duration and varying intensity, usually beginning and ending abruptly.
H. Thunderstorms--Downpour of rain, often with strong gusty winds. Small hail may also be present.
I. Severe Thunderstorm—A Thunderstorm accompanied by wind gusts to 50 Knots (58 mph) or greater, hailstones of 3/4 inches or larger, and/or a tornado.

3. Max/Min Temperature: The temperature will be in degrees Fahrenheit.

4. Max/Min Relative Humidity: The Relative Humidity (RH) is the ratio, in percent, of the amount of moisture in the air compared to the amount the air could hold if fully saturated (100%). The range of RH is from 0% to 100%. Usually, the minimum RH occurs at the time of the maximum temperature and the maximum RH occurs at the time of the minimum temperature.

Because of the dependency of the relative humidity upon temperature, it should be noted that if the temperature is under forecast (the actual temperature is higher than forecast), then the forecasted relative humidity will likely will be too high.

5. Wind (20 ft): Direction and Speed: The wind direction will be forecast to the sixteen cardinal points of the compass and expressed in miles per hour (mph). Wind direction will indicate the direction the wind is blowing from **(i.e. SSW 15 mph).** Since most surface observation stations used for National Weather Service forecasts measure wind speed/direction at 10 meters (roughly 33 feet) with a two minute average, a reduction factor is used to arrive at the 20 foot wind forecast. Any significant changes expected during the forecast period will be mentioned in the narrative.

The wind speed will be in miles per hour (mph). The speed is the forecast for the 20-foot level. Speeds pertain to the two minute averages while gusts pertain to the maximum instantaneous value expected.

6. Wind Shift: If a shift in wind direction associated with a frontal passage is expected during the period, the new direction and wind speed will be forecast. Wind shifts may also be mentioned in the synopsis. Because a front may take several hours to move through a zone, the approximate time of the wind shift will be encoded (i.e. Northeast 10 to 15 mph after midnight).

7. Smoke Management Forecast Parameters: The forecast parameters include mixing height, transport wind, and smoke dispersal. Note: The Clean Air Act has established 500 meters (1700 feet) as a minimum for mixing height for permitting prescribed burning.

A. **Maximum Mixing Height**

Mixing height is the extent or depth to which smoke will be dispersed by means of turbulence and diffusion. The forecast of mixing height is expressed in feet above ground level.

B. **Transport Wind**

Transport wind is the average wind speed in mph in the mixing depth above the surface. These winds are a good indication of the horizontal dispersion of suspended particles. The transport wind is the forecast wind at the time of maximum mixing of the atmosphere, normally during the mid afternoon. Usually a wind of less than 8 mph restricts an agency from burning. Transport wind directions are typically given to eight compass points (e.g. northeast, east southwest, etc.)

C. Smoke Dispersal: Dispersion is a combination of vertical mixing and horizontal transport. These two components are independent of each other. Vertical mixing is a function of atmospheric stability. A stable airmass is characterized by poor vertical mixing; an unstable airmass is characterized by good vertical mixing. Horizontal transport is a function of wind speed: the stronger the wind, the better the horizontal transport.

It is computed using the maximum mixing height and transport winds. Indices are reported in knot-ft: Indices are:

0-28,999 Poor
29,000-37,999 Marginal
38,000-49,999 Fair
50,000-94,999 Good
> 95,000 Excellent (Burn with caution)

(Dispersion is related and often interchanged with the term "VENTILATION". The ventilation index is a product of mixing height TIMES the transport wind and is measured in knot-feet.)

Note: Transport winds are not encoded for the nighttime portion of the forecast.

8. Haines Index (HI): An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air.

The HI numbers are computed for 3 different elevations using the following parameters:
HI = STABILITY TERM (A) + MOISTURE TERM (B)

NWS Indianapolis uses low elevations to compute the moisture and stability terms for HI where:
A = 950-850 MB TEMP
B = 850 MB TEMP-DEW POINT

Moisture and stability terms are categorized as follows:

A=1 when 3 deg C or less	B=1 when 5 deg C or less
A=2 when 4-7 deg C	B=2 when 6-9 deg C
A=3 when 8 deg C or more	B=3 when 10 deg C or more

Haines Index classifications are assigned to values 2 through 6 as shown below:

Haines Index	Potential for Large Fire Growth
2 or 3	Very Low
4	Low

5	Moderate
6	High

INDIVIDUAL STATION FORECASTS

Maps showing the locations and descriptions of NFDRS stations are included under the Attachments link.

The point forecast will be issued around 3:30 PM daily during the fire weather season. The National Fire Danger Rating System (NFDRS) is a quantitative means for evaluating the fire danger across a vast area such as a forest. This complex model of fuel and weather parameters processes daily weather observations and fuel moisture as input, and fire managers receive numeric output that suggest the severity of fire danger over a large area.

Example of a NFDRS forecast:

FCST,125701,070604,13,1,70,50,1,1,W,10,M,76,50,80,40,0,0,N

ID 1	DATE 2	VT 3	WX 4	TT 5	RH 6	L1 7	L2 8	DD 9	VV 10	M 11	TX 12	TN 13	HX 14	HN 15	D1 16	D2 17	Y/N 18
125701	070604	1300	1	70	50	1	1	W	10	M	76	50	80	40	0	0	N

Point Forecast Terminology

1. **Station ID**
Before a forecast will be made for a station, it must have a valid station number in the Weather Information Management System (WIMS).

2. **Valid Date**
The valid date will be the next day in the order: YYMMDD

3. **Valid Time**
The valid time will be 1300 (1:00 PM) local time.

4. **State of the Weather**
A single digit number from 0 to 9.

0 Clear (Less than 1/8th of sky is cloud covered).
1 Scattered Clouds (1/8th to 4/8ths of sky cloud covered).
2 Broken Clouds (5/8ths to 7/8ths of sky cloud covered).
3 Overcast (More than 7/8ths of sky cloud covered).
4 Foggy
5 Drizzle

6 Rain
7 Snow or Sleet
8 Showers (In sight or at station and reaching the ground)
9 Thunderstorms/Hail

5. **Temperature**
Temperature forecast for 1:00 PM the next day.

6. **Relative Humidity**
Relative Humidity forecast for 1:00 PM the next day.

7, 8. **Lightning Activity**

A. Period 1 (L1) is from 2:00 PM until midnight that night (a 10 hour period). Period 2 (L2) is from midnight the night of the forecast until midnight the next night (24 hour period.)
B. A single digit (1 through 6) will be used. The meaning of each number is as follows:

1 No thunderstorms
2 Few building cumulus with isolated thunderstorms
3 Building cumulus with scattered thunderstorms, light to moderate rain reaches the ground.
4 Thunderstorms common but do not obscure the sky, moderate rain reaches the ground.
5 Thunderstorms common and occasionally obscure the sky, moderate to heavy rain reaches the ground.
6 Same as 3 above but dry, no rain

9, 10. **Wind Direction and Speed**
Wind forecast at 1:00 PM the next day. The wind speed is a 10 minute average at 20 feet above the ground measured to 16 compass points (e.g. WSW, NW, NNE, E, etc).

11. **Ten Hour Time Lag Fuel Moisture**
Since the fire weather meteorologist does not typically have access to fuel moisture information, an "M" for missing will be listed.

12,13. **Max and Min Temperatures**
The 24 hour maximum and minimum temperature forecast from 1:00 PM the day of the forecast until 1:00 PM the next day. This will typically be the maximum temperature of the current day and the overnight low expected in the next 12 to 16 hours.

The temperature in the maximum temperature column must be at least equal to or higher than the temperature given in part (6) above. If not, WIMS will not process a forecast for that station.

14,15. **Max and Min Relative Humidity**
The 24 hour maximum and minimum Relative Humidity forecast from 1:00 PM the day of the forecast until 1:00 PM the next day.
The maximum RH value listed must equal or exceed the value given in part (6) above. Similarly, the minimum RH value must equal or be less than the value in part (6) above. Either error will cause WIMS to not process a forecast for that station.

16,17. **Precipitation Duration**
The number of hours for which precipitation is forecast are indicated. Period 1 is from 1:00 PM the day of the forecast until 5:00 AM the next day (16 hours). Period 2 runs from 5:00 AM the next day until 1:00 PM that same day (8 hours).

18. **Wet Flag**
Wet flag is used to indicate "fuels wet". All indices will be forced to zero if Y=yes is used. NOTE: in most cases an N=no will be used unless there is snow on the ground or the ground is extremely wet. If the duration of precipitation is 3 hours or greater between 5:00 AM to 1:00 PM of the next day, the Wet Flag should be tripped to a Y value. Also if rain or snow is expected to be occurring at 1300, the Wet Flag should be tripped to a Y value.

Red Flag Forecasts

Specific conditions must be met for a Fire Weather Watch and/or a Red Flag Warning to be issued. These conditions are as follows:

Ten hour fuel moisture values must be 8% or less. In addition to this fuel moisture criterion, both of the following must occur or have a high probability of occurring:

1) Afternoon relative humidity levels expected to fall to:
25% or lower.

2) 20 foot sustained winds are expected to reach or exceed:
15 mph.

If the forecast office issues a Fire Weather Watch or Red Flag Warning for a specific forest or national park, the fire weather forecaster will highlight the watch or warning in the narrative forecast by using a headline.

A **"Fire Weather Watch"** is used to alert the user to the possible development of a Red Flag event in the near future. This could be up to 96 hours in advance.

A **"Red Flag Warning"** will be issued to warn the user of an impending or ongoing Red Flag event. A Red Flag Warning will be issued immediately when Red Flag Conditions are occurring. A RFW warns of an impending, or occurring Red Flag Event. Its issuance denotes a high degree of confidence that weather and fuel conditions consistent with local Red Flag Event criteria will occur in 48 hours or less. Longer lead times are encouraged when confidence is very high or the fire danger situation is critical. Forecasters can issue the warning for all or selected portions within a fire weather zone.

Because of the restrictions on user programs brought about by a Red Flag Warning, it is imperative that the warning be promptly canceled when the conditions cease to exist or if the conditions are no longer expected to develop.

Special Weather Statements (SPS) for Enhanced Fire Danger

There will be some occasions where criteria is *close* to Red Flag Warning Criteria and a decision is made to use “Enhanced Fire Danger” wording in the beginning of the text of the Fore Weather Forecast (FWF) (headlined just above the Fire Weather Synopsis), in addition to issuing a Special Weather Statement (SPS), and mentioning it in the Hazardous Weather Outlook (HWO).

Spot Forecasts

Prescribed Burn forecasts may be requested by federal or state agencies, especially in cases where a prescribed burn is critical or especially large. Federal or state agencies may also request Spot Forecasts for support of wildland fire incidents.

NWS offices will not provide spot forecasts to private citizens or commercial entities not acting as an agent of a government agency.

Requests for Spot or Prescribed Burn forecasts will be made using the internet based NWSSPOT request form. Spot or Prescribed Burn Forecasts can be requested from the appropriate National Weather Service Office at the websites listed under the Internet Access section. As a courtesy, land management agencies are requested to call the appropriate National Weather Service Office, to confirm receipt of the spot or prescribed burn forecast request. Once the forecast is completed, it will be available on the NWSSPOT website.

If the NWSSPOT server is down, requests for a spot forecast should be called in or faxed to the forecast office. In this case, the forecast will be faxed back to the requesting agency.

Unless otherwise stated by the requesting agency, the forecast parameters of sky condition, weather, temperature, relative humidity, 20 foot wind, significant/sudden changes in wind speed or direction, along with mixing heights, and transport winds shall be provided.

Federal or state agencies requesting prescribed burn or a spot forecast should provide location, elevation, slope, and aspect of the prescribed burn or wildland fire site. This will aid the forecaster in providing a more specific forecast.

METHODS OF COMMUNICATION

Regular Forecasts
The narrative forecast and the NFDRS may be found on the Internet at the addresses listed under Internet Access.

Watches and Warnings
Fire Weather Watches and Red Flag Warnings may be found on the Internet at the addresses listed under Internet Access. These products are not typically broadcast on NOAA Weather Radio.

SPECIAL SERVICES

Special meteorological services meet the needs of agencies that often have unique requirements for weather support, and may best be performed by the fire weather meteorologist away from the home forecast office. These services usually must be initiated by the requesting agency, and costs such as travel and per diem will be charged to a reimbursable task number assigned for the project.

Special services may include fire weather station visits, familiarization trips to the forest, observer training sessions, and S-290, S-390, S-490, and other courses. The fire weather meteorologist may be asked to attend a prescribed burn when available. If the trip involves an overnight stay, the letter should state that the requesting agency will pay travel expenses. A one day trip will not incur any costs to the requesting agency. When the land management agency wishes for a fire weather forecaster to attend a course, the same procedure for requesting a forecaster to a station visitation should be followed, except that specific dates should be given in the letter. The letter will be forwarded to NWS Central Region Headquarters so that a reimbursable task code can be assigned for the trip.

A. **Fire Weather Stations**
Supplies, equipment, and maintenance of the fire weather station are the responsibility of the land management agency (station owner). If a new station is being established, or an old station is moved to another location, a station number will be assigned by the fire weather program leader for the National Weather Service Central Region Headquarters located in Kansas City. The land management agency should provide the latitude and longitude of the new station, and the elevation when requesting a station number.

B. **Fire Weather Services – On Site Support**
On-site forecast service is a non-routine service available from National Weather Service Offices with designated Incident Meteorologists (IMETs). The NWS will provide IMET services upon request of federal, state, tribal, or local government fire agencies in support of wildfires. This support typically includes dispatches to Incident Command Posts, but

may also include dispatches to land management coordination and dispatch centers, and Area Commands.

IMET support will also be considered for non-wildfire situations if resources permit. Such uses will be limited to requests of federal fire agencies participating in the Interagency Agreement (see NWS Instruction 10-406), and requests by a public safety official who represents such support as essential to public safety (see section 4 of National Weather Service Instruction 10-401).

Procedures to request the services of an IMET are detailed in NWS Instruction 10-402.

Appendix

1. **Example of Narrative Fire Weather Forecast**:

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FIRE WEATHER PLANNING FORECAST FOR CENTRAL INDIANA
NATIONAL WEATHER SERVICE INDIANAPOLIS IN
400 AM EDT MON JUN 4 2007

.DISCUSSION...HIGH PRESSURE WILL KEEP MOSTLY CLEAR SKIES AND DRY
CONDITIONS ACROSS CENTRAL INDIANA THROUGH TONIGHT. A COLD FRONT
WILL BRING SCATTERED THUNDERSTORMS TUESDAY AFTERNOON. WINDS WILL
REMAIN LESS THAN 15 MPH.

INZ047-050800-
MARION-
400 AM EDT MON JUN 4 2007

.TODAY…
SKY/WEATHER……SUNNY.
MAX TEMPERATURE……AROUND 82.
MIN HUMIDITY……36 PERCENT.
WIND (20 FT)……SOUTH WINDS AROUND 10 MPH.
SMOKE DISPERSAL……GOOD (74200 KNOT-FT).
MAX MIXING HEIGHT…2900-3400 FT AGL.
TRANSPORT WIND……SOUTHWEST AROUND 20 MPH.
PRECIP AMT……NONE.

.TONIGHT…
SKY/WEATHER……PARTLY CLOUDY.
MIN TEMPERATURE……AROUND 60.
MAX HUMIDITY……80 PERCENT.
WIND (20 FT)……SOUTHWEST WINDS AROUND 10 MPH.
PRECIP AMT……NONE.

.TUESDAY…
SKY/WEATHER……PARTLY SUNNY. CHANCE OF
                      THUNDERSTORMS.
MAX TEMPERATURE……AROUND 79.
MIN HUMIDITY……43 PERCENT.
WIND (20 FT)……SOUTHWEST WINDS AROUND 10 MPH.
SMOKE DISPERSAL……EXCELLENT (238600 KNOT-FT).
MAX MIXING HEIGHT…7700-8200 FT AGL.
TRANSPORT WIND……SOUTHWEST AROUND 25 MPH.
PRECIP AMT……0.16 INCHES.
$$

.FORECAST DAYS 3 THROUGH 7…
.WEDNESDAY…MOSTLY CLOUDY. CHANCE OF THUNDERSTORMS. LOWS IN THE
MID 50S. HIGHS AROUND 70. NORTH WINDS AROUND 5 MPH.
.THURSDAY…PARTLY CLOUDY. LOWS IN THE UPPER 40S. HIGHS IN THE
LOWER 70S. NORTHEAST WINDS AROUND 5 MPH.
.FRIDAY…PARTLY CLOUDY. LOWS IN THE UPPER 40S. HIGHS IN THE MID
70S. EAST WINDS AROUND 5 MPH.
.SATURDAY…PARTLY CLOUDY. LOWS IN THE MID 50S. HIGHS IN THE MID
70S.
.SUNDAY…PARTLY CLOUDY. LOWS AROUND 60. HIGHS AROUND 80.
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2. Example of a National Fire Danger Rating (NFDRS) Forecast

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FCST,125701,070605,13,1,83,45,1,3,SW,10,M,85,62,80,36,0,2,N
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3. Map of Hardin Ridge